

# Military Training is Social

A team or battalion is highly social and community centered.

Ideally learning will be informal and autonomous, with each soldier aware of his/her learning needs based on team requirements, task, project or duty.

Each soldier will define relevant learning goals and access resources and team members to reach these goals.





Credit: Lewis Johnson [www.alelo.com](http://www.alelo.com)  
[www.tacticallanguage.com](http://www.tacticallanguage.com)



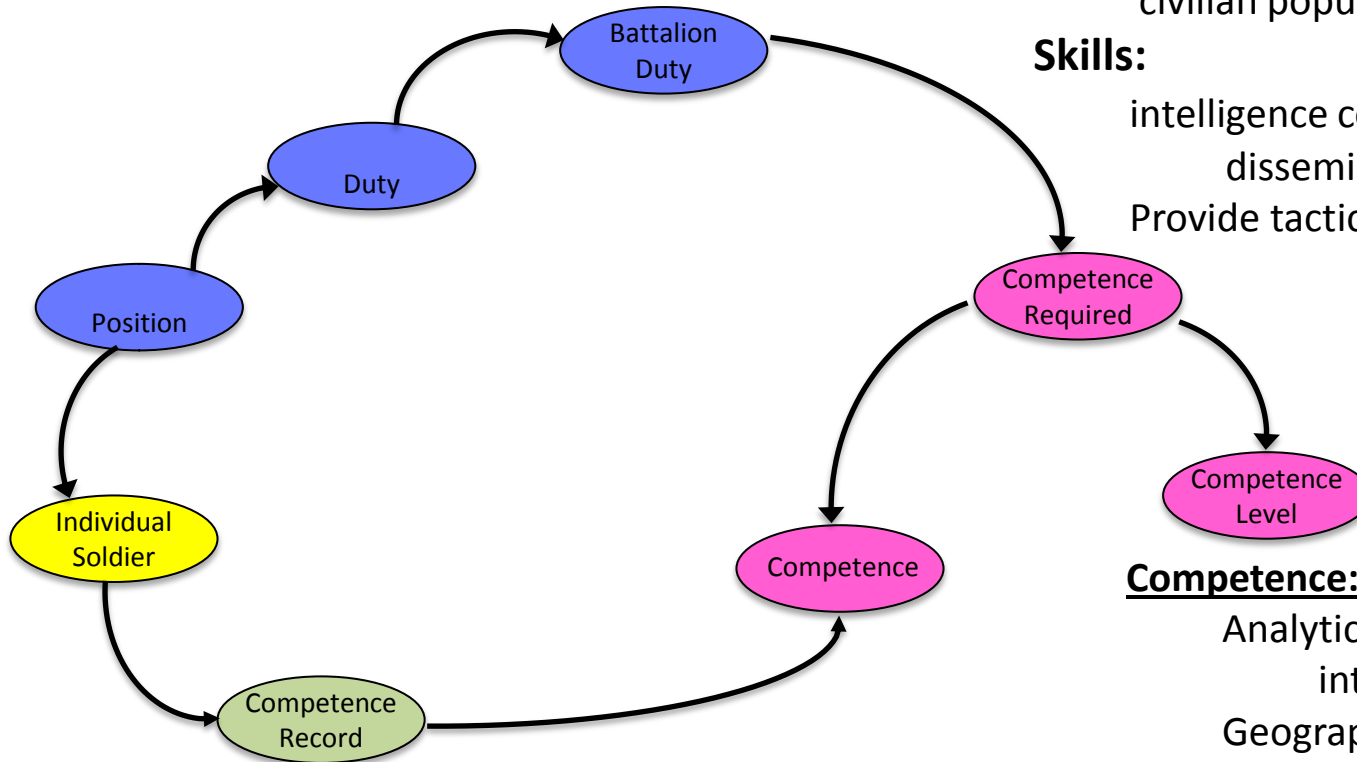
# Provide Individual Training

Ensure that each soldier has structured learning scenarios, can initiate a learning process and find a path towards achieving that goal.



# Competence Ontology

## Example: Intelligence Officer



### Knowledge:

operational environment,  
hostile, friendly and neutral forces,  
civilian population

### Skills:

intelligence collection, analysis and  
dissemination  
Provide tactical or strategic advice

### Competence:

Analytical abilities and personal  
intelligence  
Geographic knowledge  
Records foreign nationals  
Problem solving, reasoning  
Interviewing skills

# Role of Ontologies

- Provide battalion duties

- Identify social and battalion-centered competencies

- Aid soldiers to find training requirements for promotion

- Personal ontologies enable soldiers to:

  - Define and monitor their learning goals

  - Adapt strategies and action to battalion needs and goals.

  - Monitor their learning process to increase motivation, self-sufficiency and skill acquisition

# Research Needed

- ❑ Serious Games
- ❑ Intelligent Environments
- ❑ User Models
- ❑ Mobile Tools



Photo Credit: Mike Sharples



# □ Serious Games

- **Exploit the significant investment by the entertainment industry.**
- **Ride the increasing capability curve:**
  - **Graphics**
  - **Realistic AI**
  - **4D Environments**
  - **Development tools**
  - **Software standards**
- **Potential lower cost than development from scratch or modification of legacy simulation technology**



# Example interaction using the Tactical Language Tutor.



The trainee approaches and greets a native Iraqi respectfully by placing his right hand over his heart while saying "as- salaamu aleykum" (selecting the gesture with the mouse wheel and speaking into a microphone). The aide stands right behind him, ready to help if needed.

*Lewis Johnson, Alelo*



# Tactical Language and Culture Training System

- Rapid training in foreign language and culture
  - Focus on spoken communication
  - Focus on particular tasks
- A combination of gaming and intelligent tutoring
  - Mission Game
  - Arcade Game
  - Skill Builder



# Game Views



Mission Game



Arcade Game

# Some Quotes

- “I learned more in 4 hours than in my entire tour of duty in Iraq” (a Marine 1Sgt)
- “I intend to devote a set amount of time per day/week using the software to help me learn Arabic. Having used it at school, I can’t wait to delve into it again.” (a Marine Captain)
- “the SNCOs... perceive that their Marines are acquiring an observable proficiency in the basics of spoken Arabic... most of them appear to be studying it diligently.” (a Marine Major)
- “a LCpl commented that he learned more in two days with Tactical Iraqi than he did in three years of high school Spanish (a Marine Major)”

# Promoting Good Gameplay

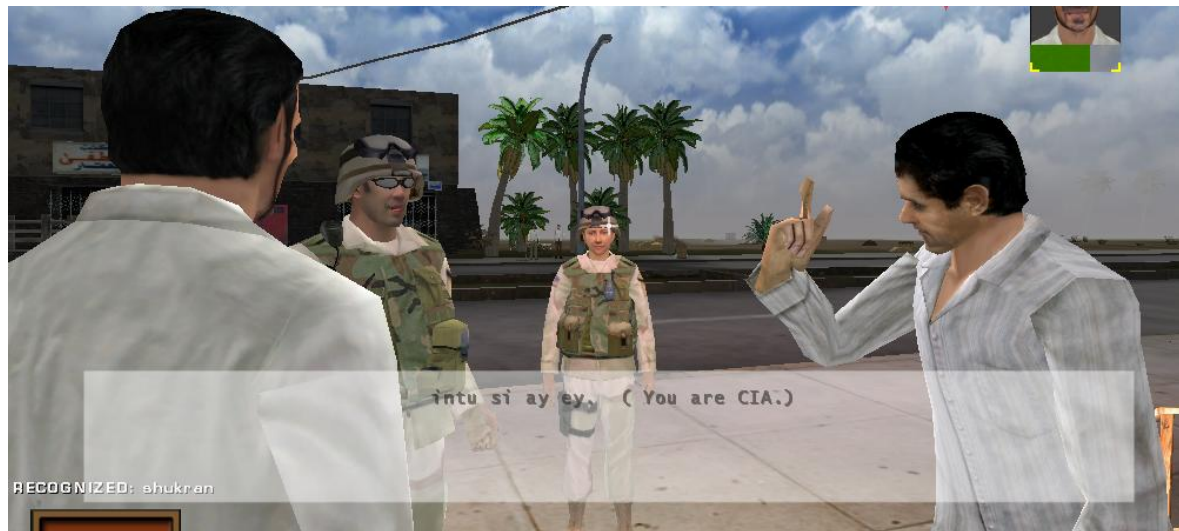
- Good games have good **gameplay**:  
engaging moment-by-moment  
interaction (Prensky, 2001)
- They:
  - Support fast, robust interaction
  - Build performance feedback  
into the game
- They do not:
  - Interrupt play with distracting  
tutorial comments





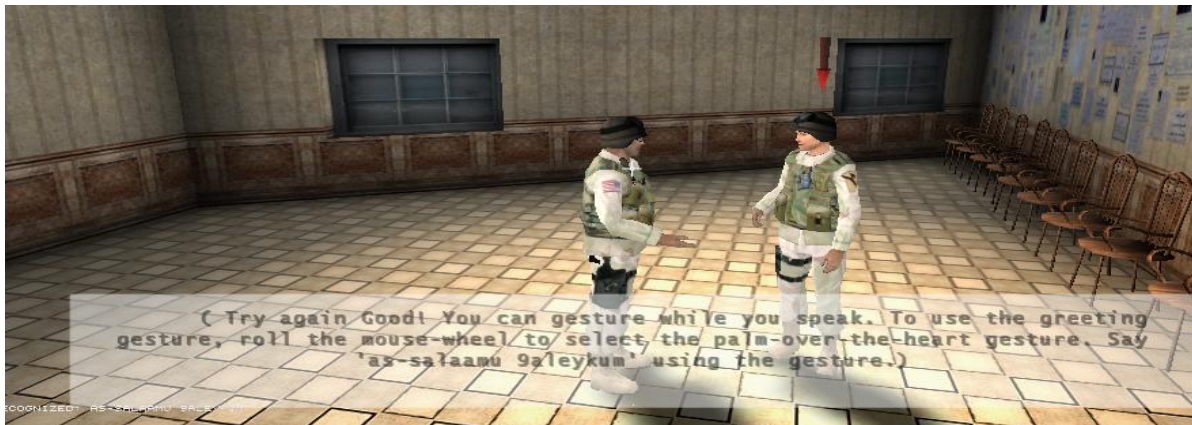
# Optimize Challenge

- Good games are “pleasantly frustrating” (Gee, 2003)
- Requirement for AI: to adjust behavior of NPCs so that the difficulty of gameplay is appropriate for the learner
  - But still give learner opportunity to fail occasionally, as this motivates and promotes sense of being in control



# Fishtanks and Sandboxes

- Good games often incorporate:
  - “fish tanks”: simplified versions of the game
  - “sand boxes”: scaffolded levels where it is harder to do something critically wrong
- Roles of AI in creating fish tanks and sandboxes:
  - Simplified character behavior
  - Guide characters who can help learners if they get stuck





# Self-Directed Learning Internet Module

## SLIM: Every Soldier a Sensor Simulation (ES3)

- **FOCUSED** on the Active Surveillance/Threat Indicator and Reporting Procedures
- Emphasis on cognitive decision-making
- User-friendly environment and object editor for ease of modification
- Integrated into Basic Training POI
- Low Cost - 90 day initial development



# Asymmetric Warfare

## Massively Multi-player Environment

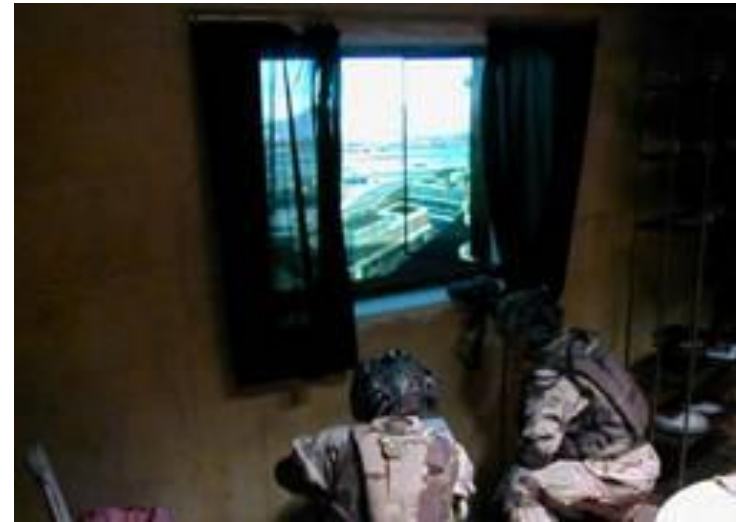
- COE unique models, avatars and terrain dbase have been built.
- The environment theoretically supports unlimited participants.
- The tool set allows one to rapidly modify the environment to establish the conditions for specific scenarios to be executed
- All avatars are virtual representations of real players
- Numerous user tests support development



# Joint Fires and Effects Training System

## Interactive Joint Fires Observer Urban Terrain Training Module

- In the Future Force, every Soldier, Sailor, Airman and Marine is an Observer.
- Observers apply Joint/Interagency/Multinational fires and effects in the full-spectrum, non-contiguous battlespace.
- JFETS is a means to train for it.
- Trains cognitive, decision-making skills in a complex immersive environment
- First Soldier training session conducted 29 Sep 04
- ~1700 Soldiers trained since 29 Sep 04



# Some Lessons Learned

- **Simulation must play a seamless integrated role in the program of instruction**
- **Instructor plays an indispensable role in planning and facilitating a game based training event**
- **Instructors must be proficient in “playing the game”**
- **Trainee’s proficiency and/or experience with video games can impact ability to effectively use a game based trainer - not everyone is a gamer**
- **Instructors must plan for and allow sufficient time for trainees to complete the game scenario**
- **Instructor-lead AAR is critical:**  
**Game based trainers cannot yet adequately assess performance and provide feedback in an automated AAR**



Credit: Lewis Johnson, [www.alelo.com](http://www.alelo.com)  
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# Autonomous Virtual Humans

- ⇒ Twin guides at the Boston Museum of Science have meaningful interactions with humans.
- ⇒ They use speech understanding and natural language processing to motivate interest and enhance the experience. Target audience 7-12 year old children.
- ⇒ Developed by the Institute for Creative Technology (ICT)



Photo Credit: Chad Lane, ICT, Boston Museum of Science

# □ Intelligent Environments

## Basic Research

- Dialogue interfaces that support students' free text and continuous speech understanding.
- Systems that allow learners to seamlessly move between real and virtual worlds (e.g., worlds that are too small, molecular level, too large, model of Mars, too long, erosion by a river, or too quick, humming bird's wing).
- Autonomous virtual characters (e.g. MoScience Twins) that are authority or peer role models.
- Interactive and self-explanatory representations that adapt to a learner's needs and take into account students' interests, intentions and goals.
- Knowledge engineering and cognitive task analysis.



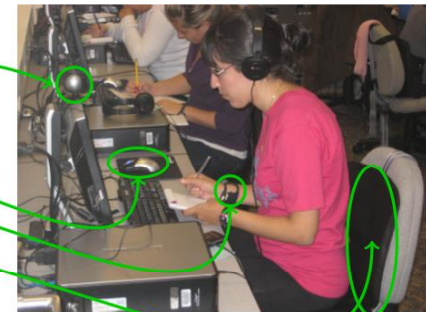
# ❖ Personalize instruction

Personalize education to harmonize with each student's *traits* (e.g., personality, learning style) and *states* (e.g., affect, level of engagement).

Develop computational tools that understand an individual as might a human tutor and support instruction based on a student's weaknesses, challenges and motivational style (e.g., wants competition, needs acknowledgement).



- Camera
- Mouse
- Bracelet
- Chair



# Data Accelerates Improvement

⇒ Data improves home / school connection and predict student performance. How quickly or slowly do students learn? What are the underlying factors that make items easier or harder for students? How should lesson design and curriculum be modified?

⇒ One data model was the target of a worldwide competition: KDD Cup (Knowledge Discovery and Data Mining), PCLS Data Shop. The best model was selected.

⇒ This contest used half a million student records—50 hours/year/student using the Cognitive Tutor “DataShop”—an NSF funded center with 5 datasets of logged student behavior to develop and test a model of learning.

# Supporting Personalized Education

- ⇒ Represent what learners know and can do. When and how was knowledge learned? What pedagogy worked best for a given learner.
- ⇒ Manage vast amounts of data, effectively store, make available and analyze data for different purposes and stakeholders.
- ⇒ Simulations and representations that explain themselves to learners. Address the communicative interaction between learners and software and use multimedia to switch modalities as appropriate.

# □ Rich Interfaces

## Basic Research

- Interfaces that sense, analyze and recognize human action, whether cognitive, meta-cognitive or affective.
- Interfaces that accommodate full sensory input based on radio frequency identification (RFID), global position sensors (GPS), smart phones, cameras, and capabilities based on haptic, augmented reality and brain-computer (fMRI-like capability and EEG) components.
- Virtual agents, embodied and robotic creatures
- interfaces that support social and personalized interactions (attuned to motivation, self-efficacy and affect) and mixed reality.
- Interfaces that support lifelong and life-wide learning at home, work, school and university.

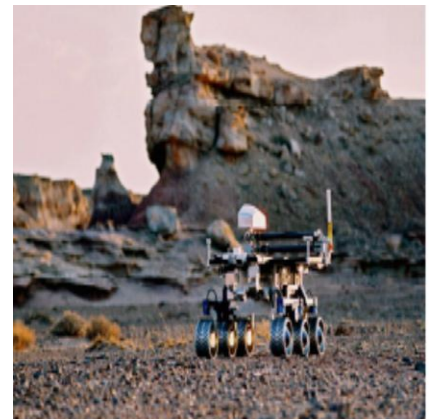


Photo Credit: Winslow Burleson

# □ User Models

## Basic Research

User models (UMs) can track trainee skills, cultural preferences, interests, and knowledge and can identify when students learned, pedagogies worked and for whom.

Develop UMs that support:

- Formative issues (the degree to which students learned how to learn)

- Summative issues (what was learned for accountability and promotion).

Develop machine learning techniques that learn rather than being programmed with knowledge, e.g., to identify misconceptions.

Develop UM shells (e.g., environments that contain the basic components of expert systems and methods for building applications).



# ❖ Assess trainee learning

Assessments should be *seamless* and *ubiquitous* and occur everywhere. They should be available every time a trainee learns and move beyond the model of Teach / Stop / Test.

Seamless refers to the removal of false boundaries between learning and assessment and ubiquitous refers to the constant nature of assessment that will feed back results and implications into learning, anywhere and anytime.



Photo Credit: One Laptop Per Child

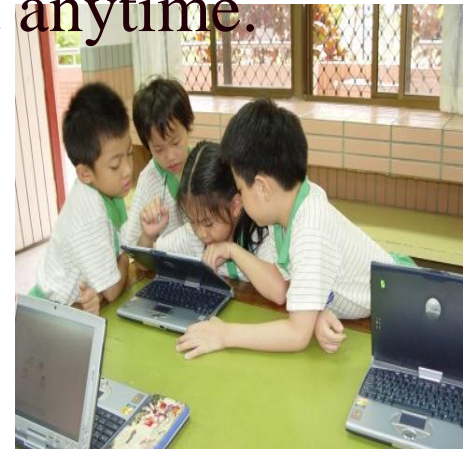


Photo Credit: Tak-Wai Chan



# □ Mobile Tools

## Research Agenda:

- Note: 78% of USA teenagers own cell phones.
- Develop mobile learning tools for exploration, investigation, discussion and recording data.
- Identify how short learning objects (e.g., when entire contact time is a few minutes) support larger learning goals.
- Demonstrate that mobile tools can promote higher quality learning, more active and social learners, and students involved in ubiquitous learning.
- Evaluate the teacher's role vis-à-vis mobile tools; demonstrate the wide variety of environments in which teachers can operate.



Photo Credit: Mike Sharples

# ❖ Social Learning

Social learning is already pervasive. We need to expand it and to support continuous learning by active students working in groups in ways that are highly distributed and valued.



Photo Credit: Tak-Wai Chan



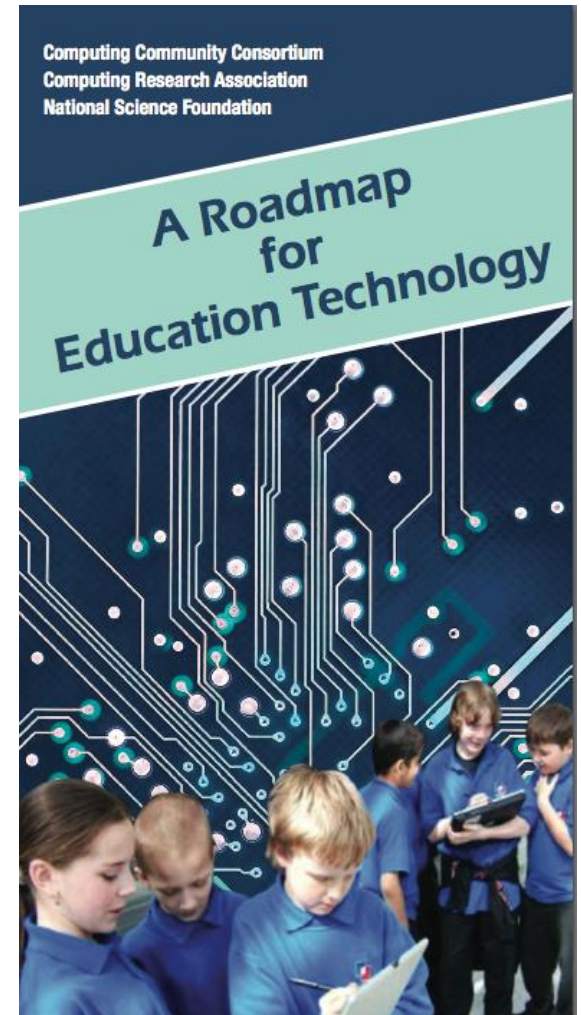
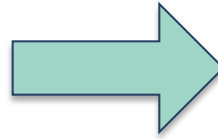
Photo Credit: Tak-Wai Chan



Photo Credit: Mike Sharples

# Further Described

Serious games  
Intelligent environments  
User Model  
Mobile Tools



available at

CRA CCC Education browser

<http://www.cra.org/ccc/groe.php>

# Further Discussion

- I am available today at 3:15 for a Round Table Discussion.
- Also tomorrow.

# Thank You !!

## Intelligent Tutors: Past, Present and Future

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